

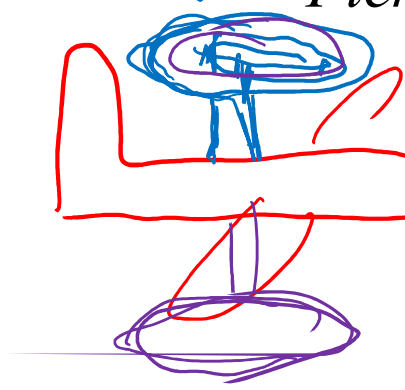
AWACS

Airborne MTI

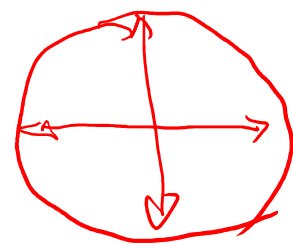
Nose antenna

Radome

Pierfrancesco Lombardo



$\pm 45^\circ$ e 60°



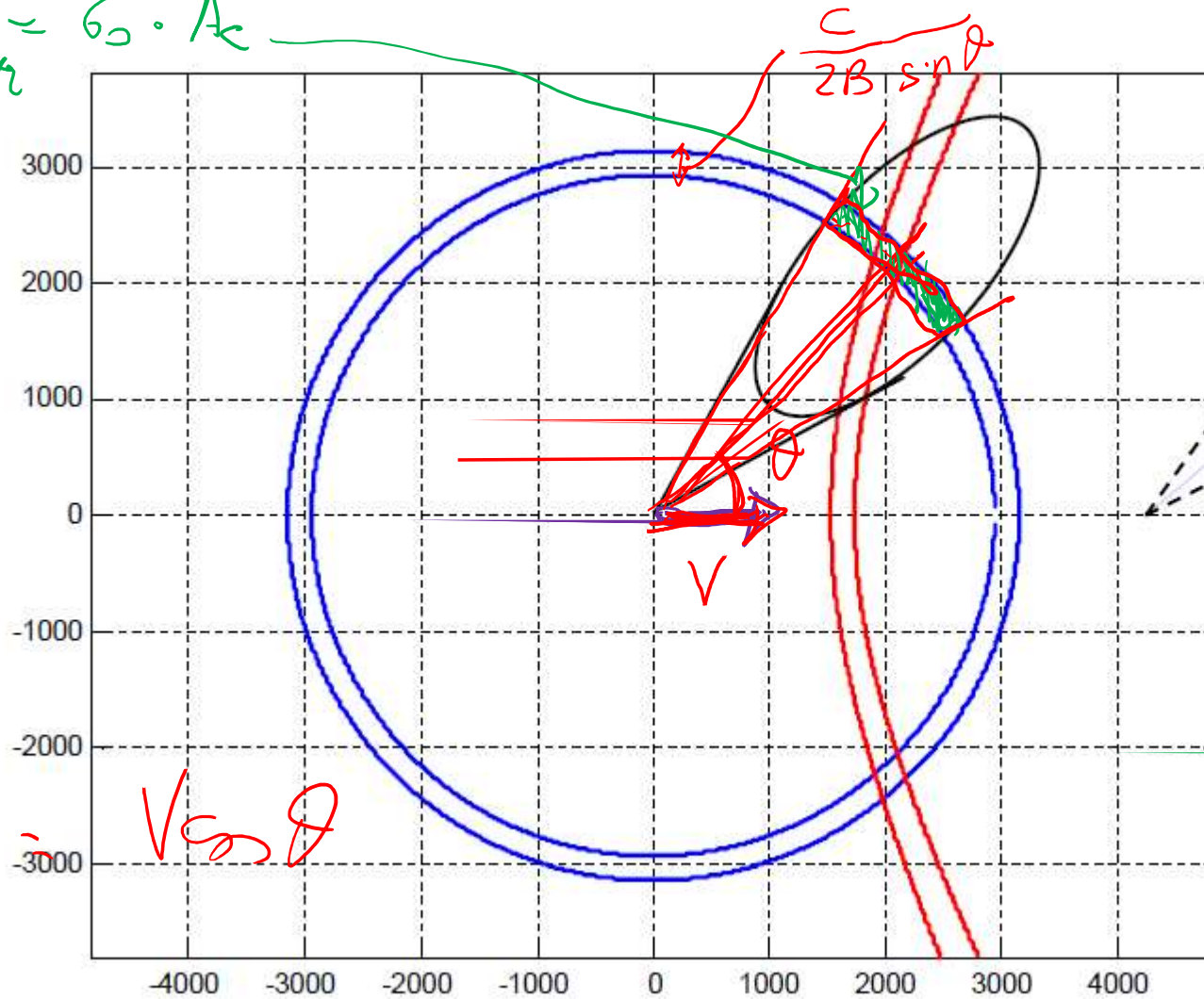
$60 \text{ cm} \times 6 \text{ cm}$

120°

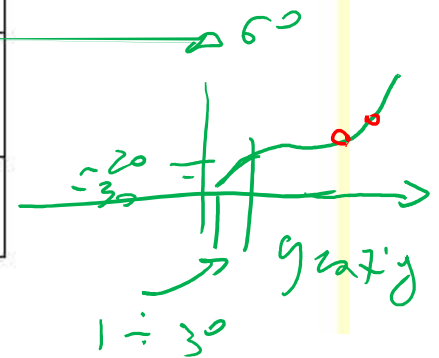
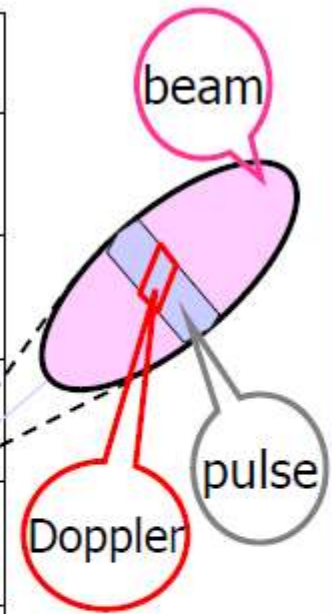
Certamente in banda X

Airborne radar: Range-Doppler clutter spread (I)

$$\sigma_{clutter} = \sigma_0 \cdot A_c$$



$$V_r = V \cos \theta$$



Airborne radar: clutter Doppler spread (I)

Per patch di clutter di superficie all'angolo θ rispetto alla direzione del moto

Doppler :
$$f_d = \frac{2}{\lambda} V \cos \theta$$

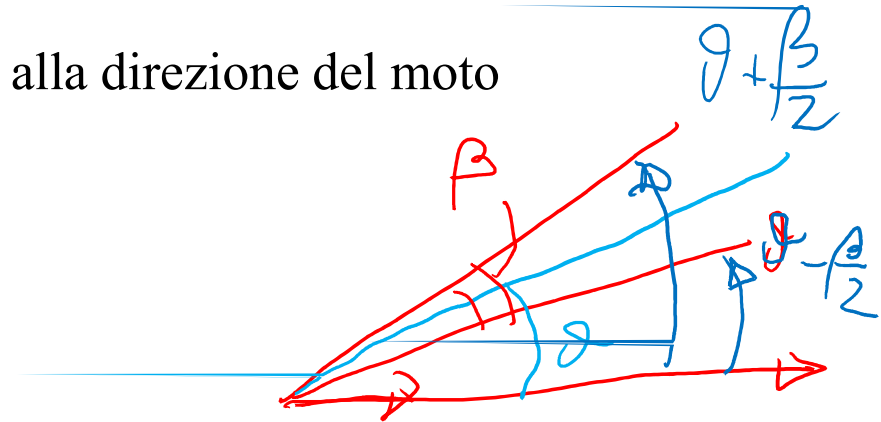
- Da ogni angolo ho il ritorno di clutter ad una diversa Doppler
- il fascio di antenna include diversi angoli, quindi il clutter di terra (che per radar fisso è concentrato intorno a frequenza zero) si disperde su un ampio range di frequenze Doppler.
- Un clutter molto disperso in frequenza (correlazione bassa) è difficile da cancellare
- Per evitare folding si impone la necessità di usare PRF alta

Airborne radar: clutter Doppler spread (II)

Puntamento di antenna ad angolo θ rispetto alla direzione del moto

Doppler media: $f_d = \frac{2}{\lambda} V \cos \theta$

Fascio di antenna di larghezza β



Banda Doppler: $B_d = \frac{2}{\lambda} \left[V \cos \left(\theta - \frac{\beta}{2} \right) - V \cos \left(\theta + \frac{\beta}{2} \right) \right] =$

$\cong \frac{2}{\lambda} V \left[2 \sin \theta \sin \left(\frac{\beta}{2} \right) \right] \cong \frac{2V}{\lambda} \beta \sin \theta$

$\frac{2}{\lambda} V \left[\cos \theta \cos \frac{\beta}{2} + \sin \theta \sin \frac{\beta}{2} - \cos \theta \cos \frac{\beta}{2} + \sin \theta \sin \frac{\beta}{2} \right]$

PRF

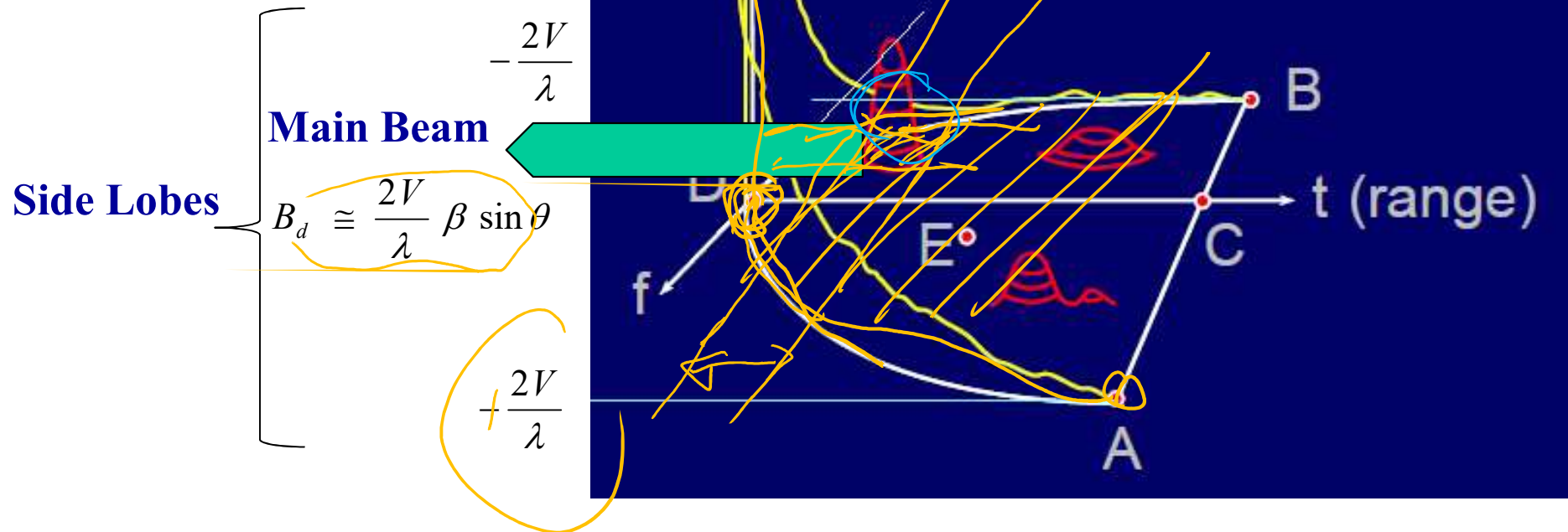
$PRF \geq \frac{2V}{\lambda} \beta \sin \theta$

Evito folding almeno del main beam!

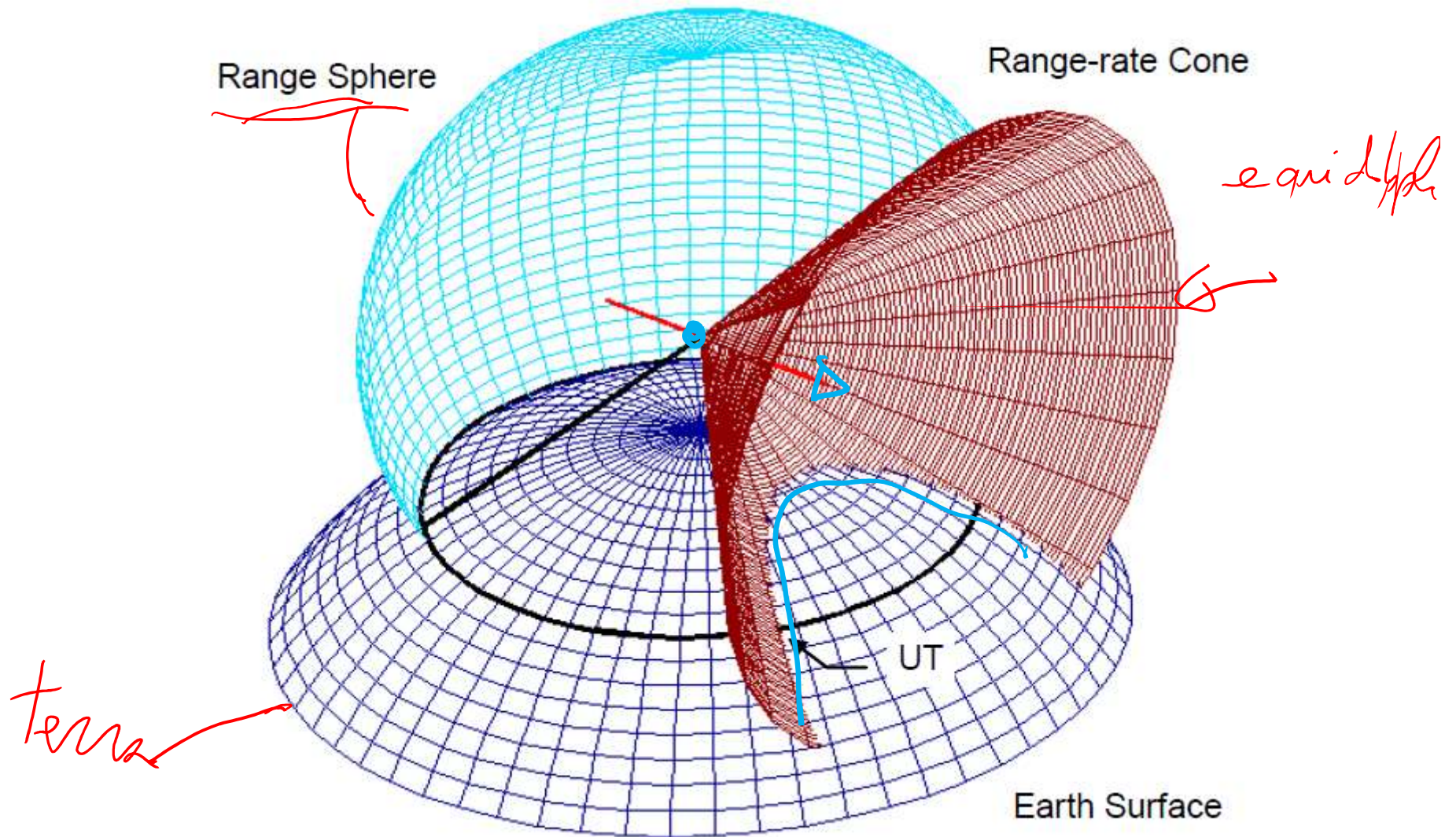
Airborne radar: Range-Doppler clutter spread (II)

ALE: Altitude Line Echo

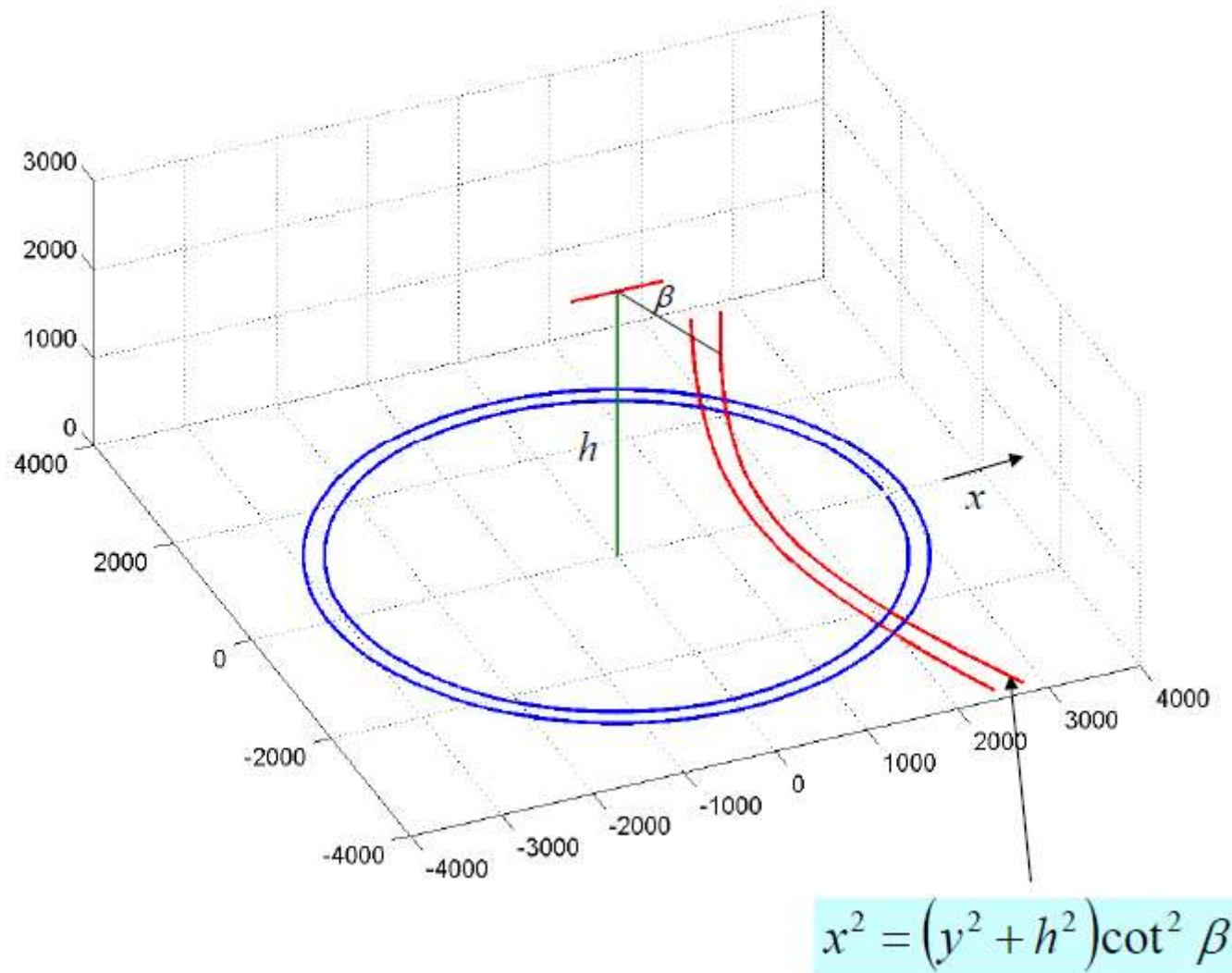
-Prima echo di ritorno
- a Doppler Zero (Nadir)



Airborne radar: Range-Doppler clutter spread (III)



Airborne radar: Range-Doppler clutter spread (IV)



Airborne radar: Range-Doppler clutter spread (V)

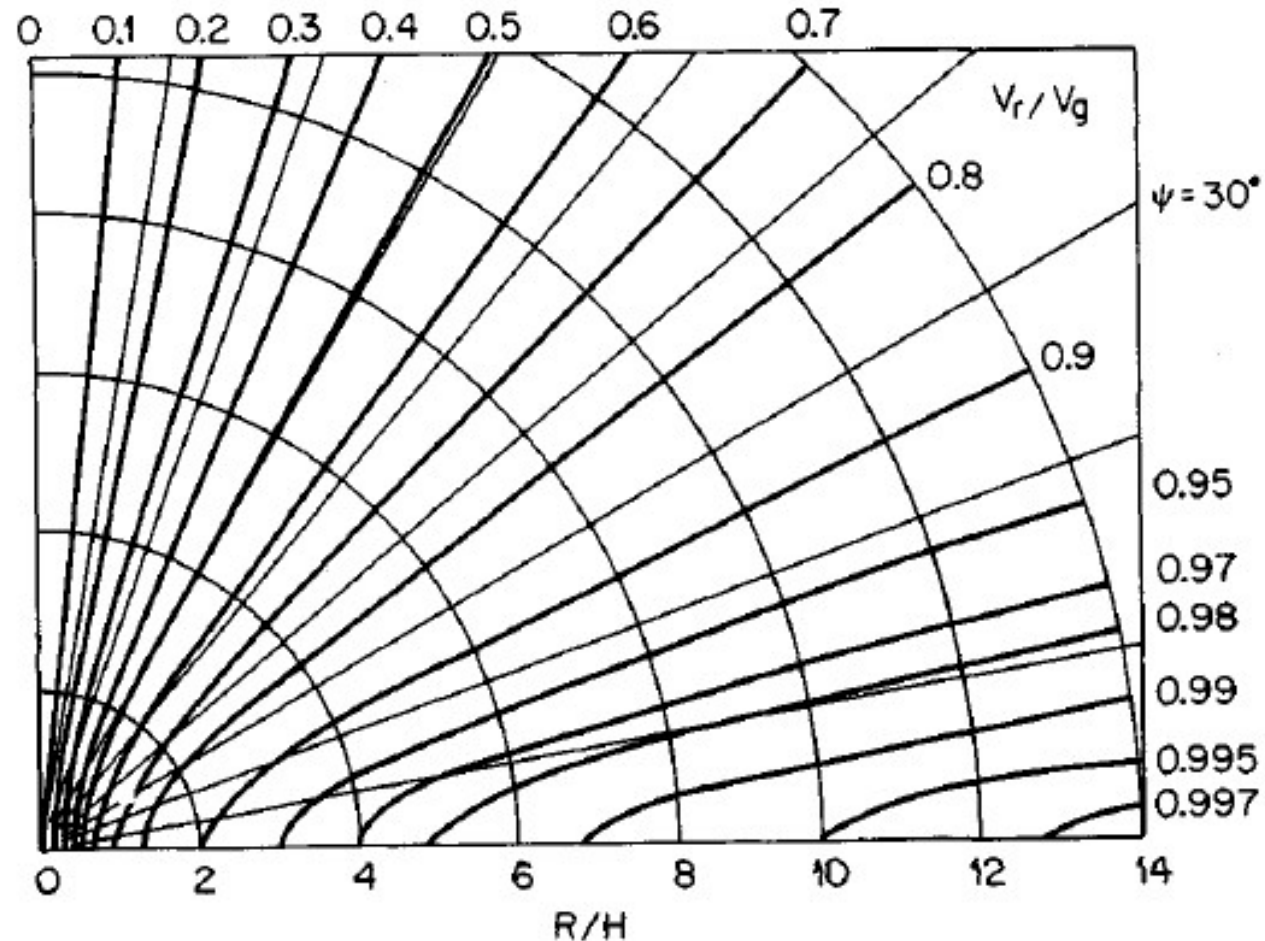


FIG. 16.3 Loci of constant normalized radial velocity V_r/V_g as a function of aircraft range-to-height ratio R/H and azimuth angle ψ .

PRF selection

Avoidance of Range Ambiguities: $1/PRF > 2 S_R/c$

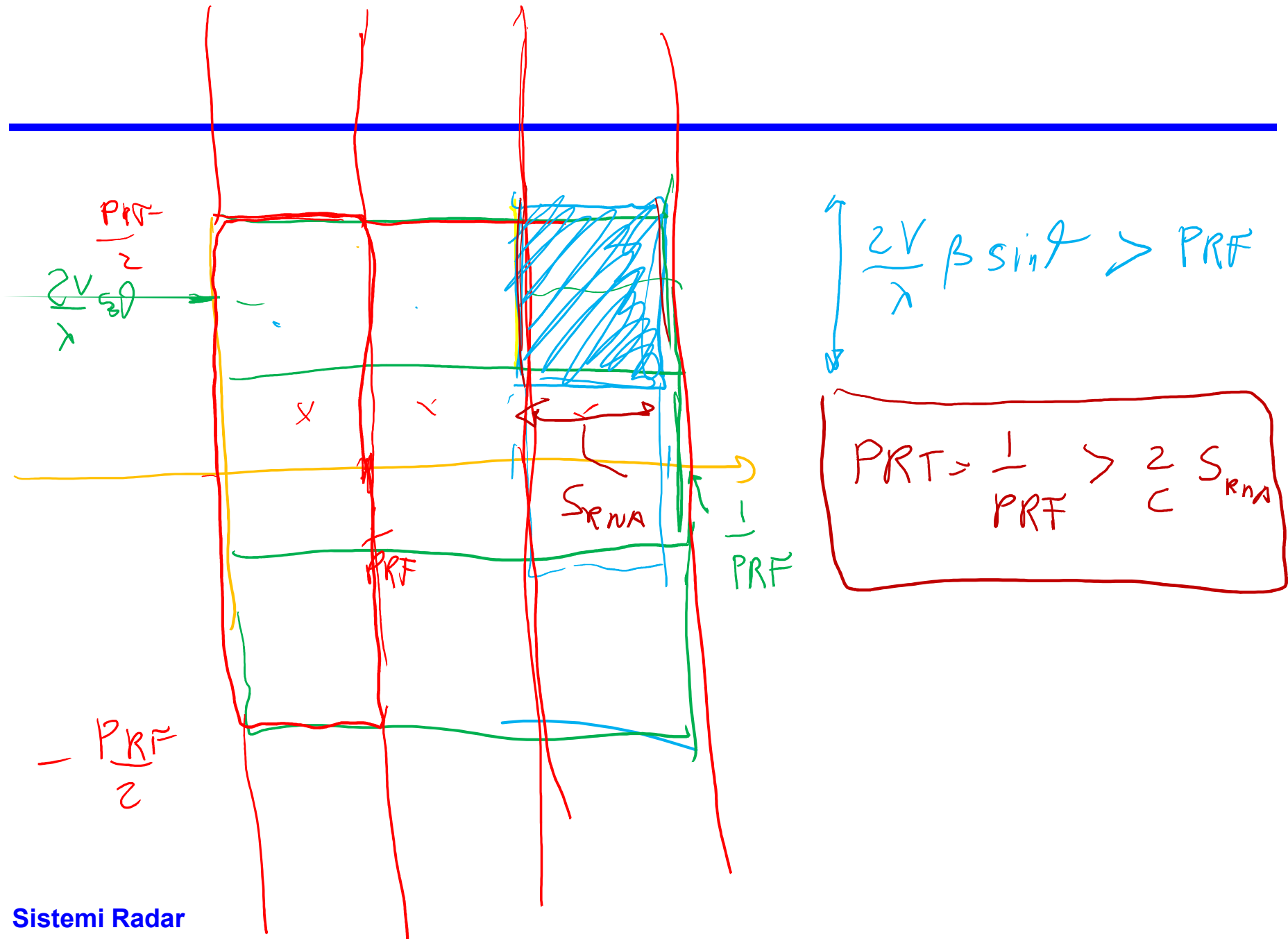
Avoidance of Azimuth Ambiguities: $PRF > 2v/\lambda * \text{Antenna beamwidth AZ}$

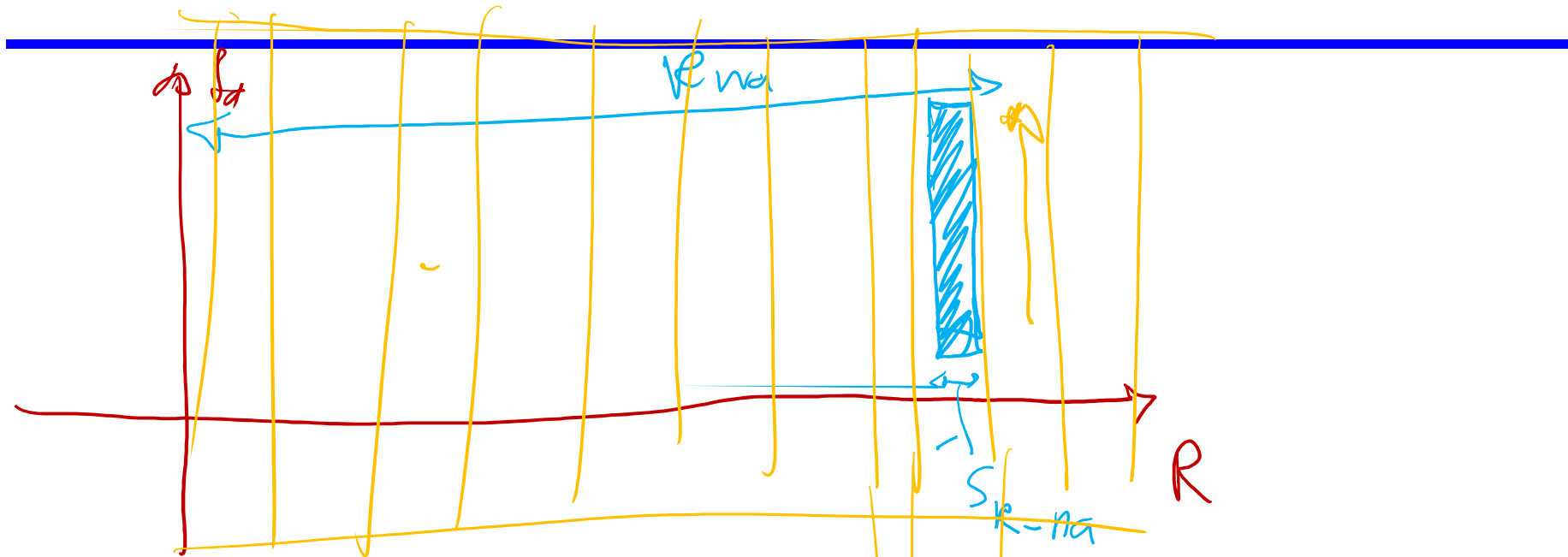
Range Swath non ambiguous: S_{R_NA}

Antenna beamwidth AZ $\psi_a = \lambda/d_a$

$\beta = \frac{\lambda}{d_a}$ $\sin \theta$

$$\frac{2v}{\lambda} \frac{\lambda}{d_a \sin \theta} < PRF < \frac{c}{2S_{R_NA}}$$

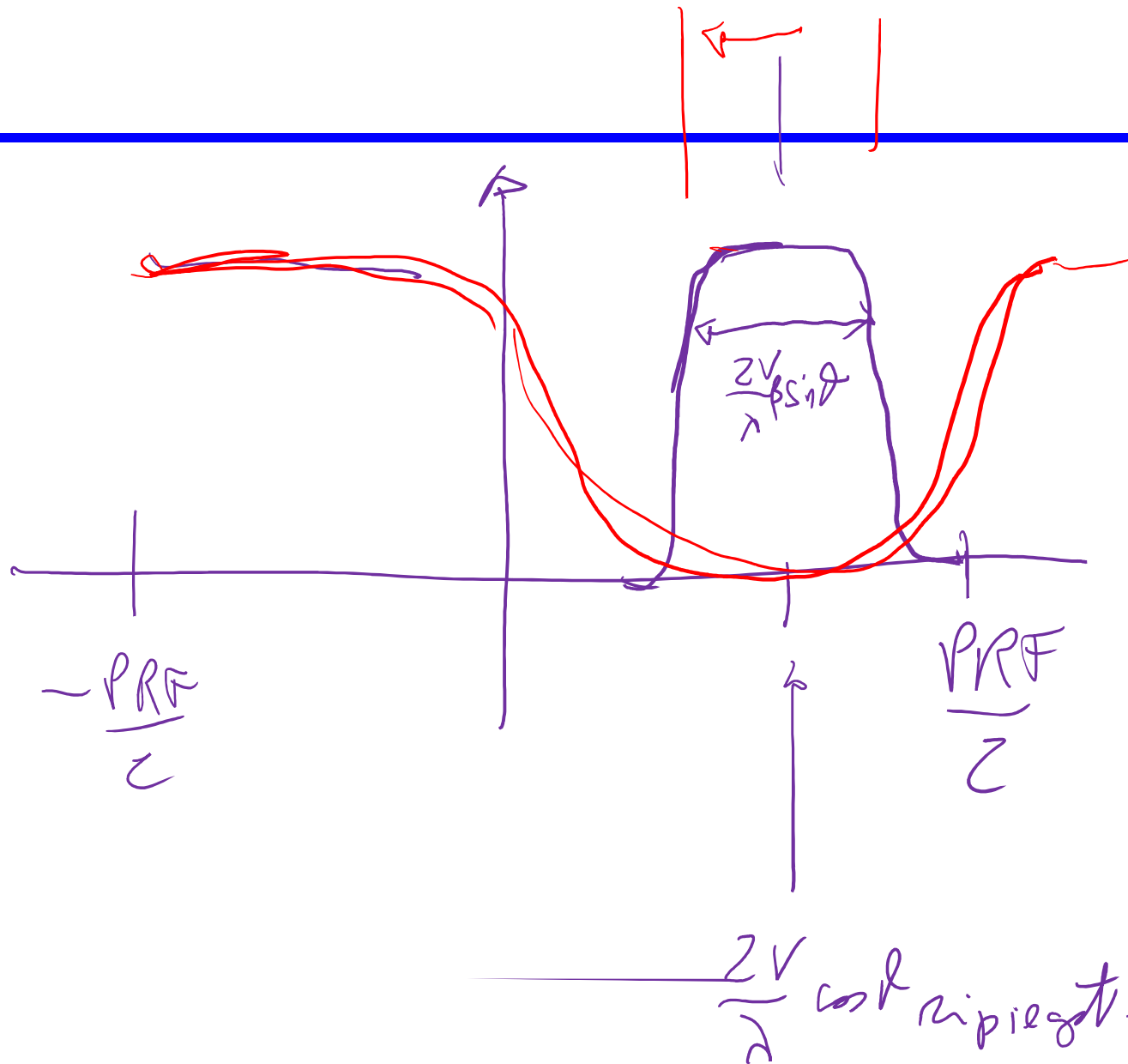


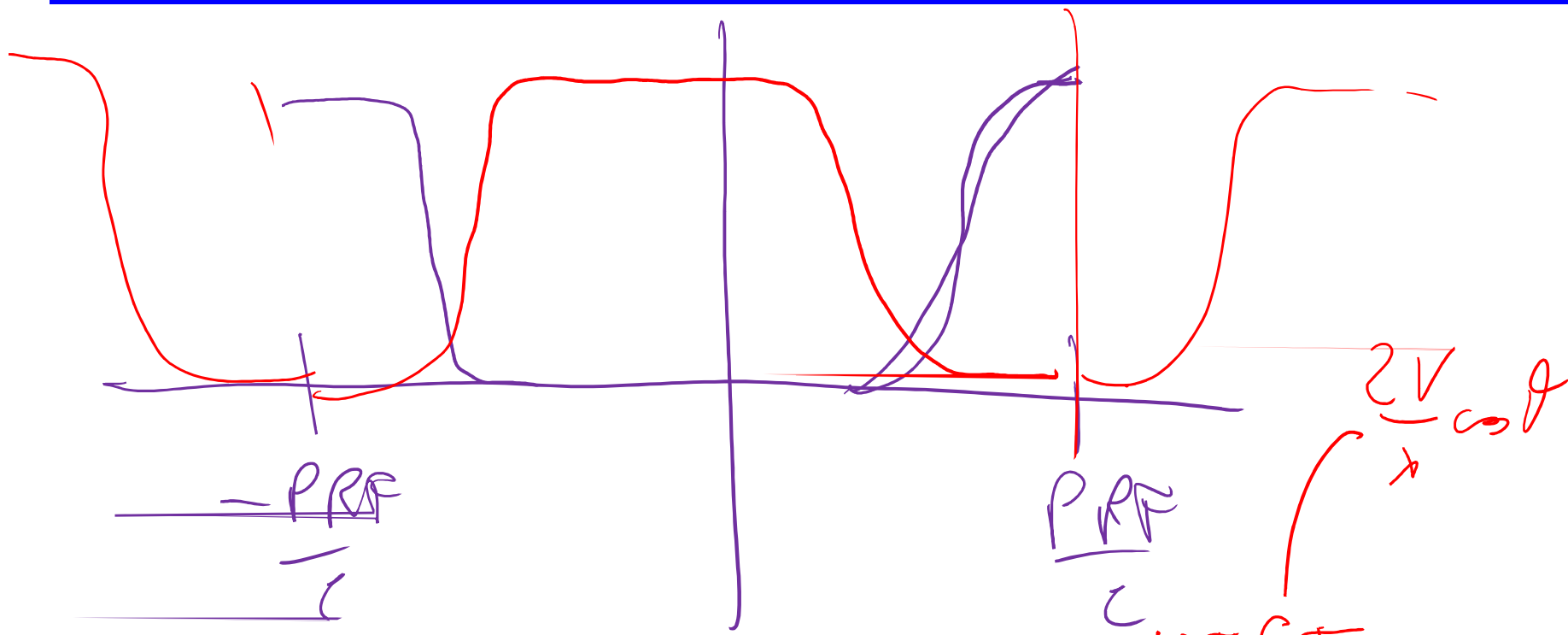


$$PRT > \frac{2S_{R-na}}{c}$$

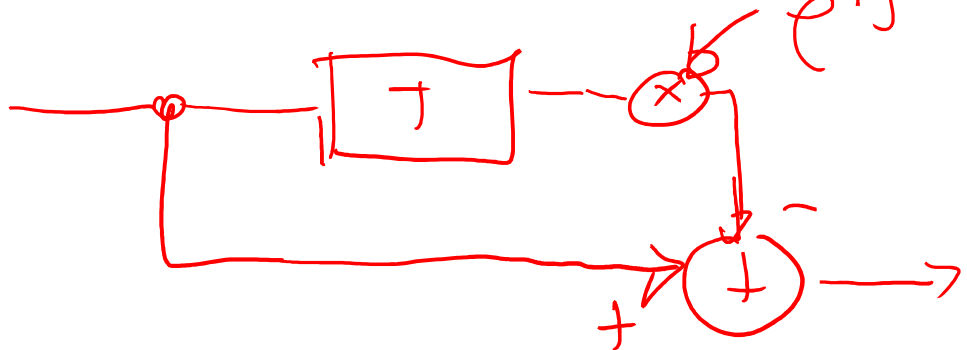
$$\left(PRT > \frac{2}{c} R_{na} \right)$$

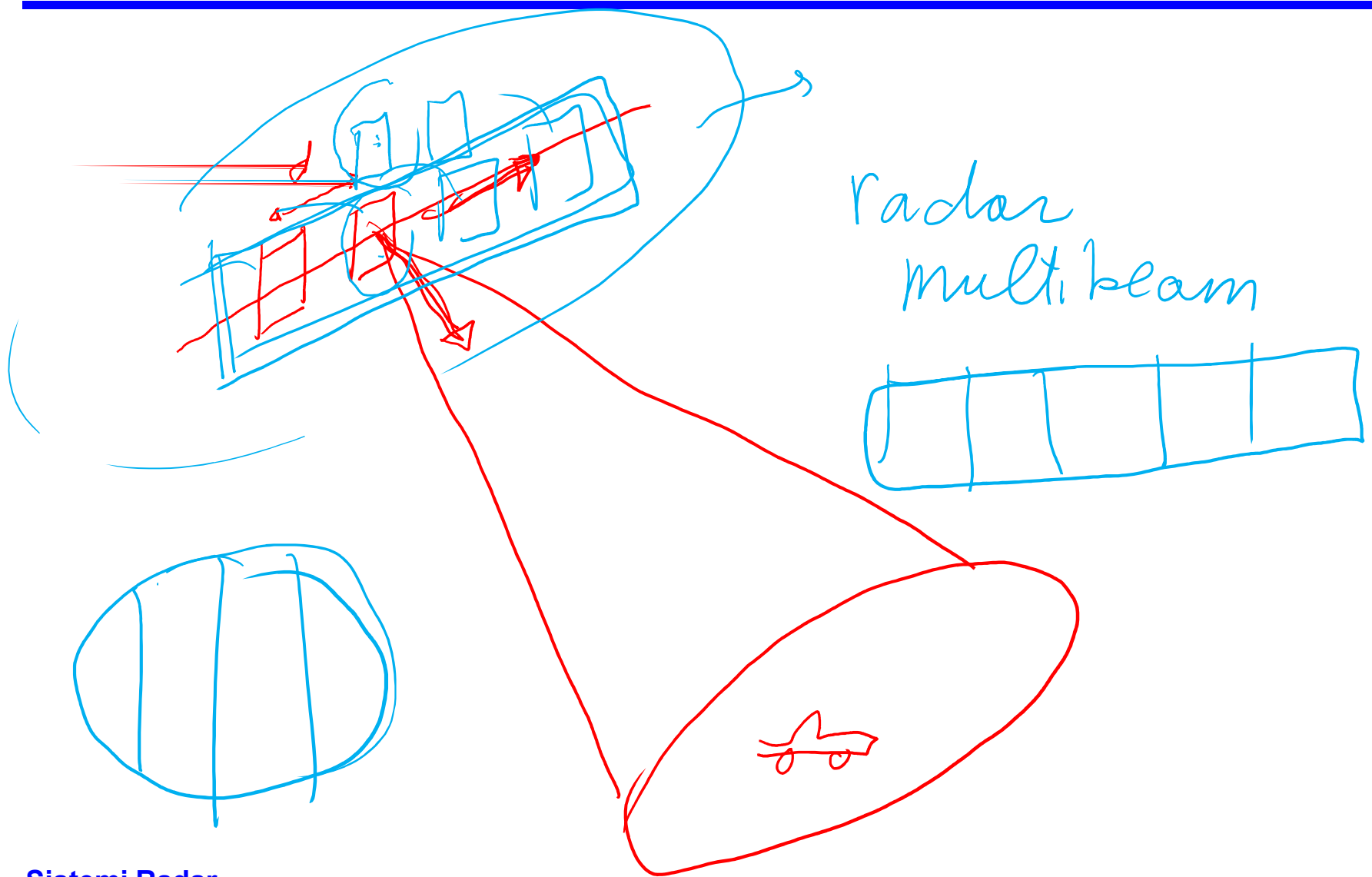
$$PRT > \frac{2v}{\lambda} \beta \sin \theta$$





$$e^{j2\pi f_c T}$$





Sistemi Radar